

## **What is claimed is:**

**[Claim 1]** 1. A pulse sequence to suppress background tissue, the pulse sequence comprising:

a slice selective pulse to spatially select an ROI for spin suppression;  
a number of non-selective RF pulses played out after the slice selective pulse to suppress magnetization of static spins within the ROI; and  
an imaging pulse played out after a number of non-selective RF pulses to excite inflowing spins to the ROI.

**[Claim 2]** 2. The pulse sequence of claim 1 wherein each of the number of non-selective RF pulses has an energy level less than that of the slice selective pulse and the imaging pulse.

**[Claim 3]** 3. The pulse sequence of claim 1 further comprising a crusher gradient pulse played out before the imaging pulse to de-phase residual transverse magnetization of spins outside the ROI.

**[Claim 4]** 4. The pulse sequence of claim 4 wherein the crusher gradient pulse dephases residual transverse magnetization at a slice orientation aligned with the spatially selected ROI.

**[Claim 5]** 5. The pulse sequence of claim 1 wherein the slice selection pulse has a flip angle of 90 degrees and the imaging pulse has a flip angle of 90 degrees.

**[Claim 6]** 6. The pulse sequence of claim 1 wherein the number of non-selective RF pulses includes pulse pairs.

**[Claim 7]** 7. The pulse sequence of claim 6 wherein the pulse pairs are applied along a plane of orientation transverse to the slice selective pulse.

**[Claim 8]** 8. The pulse sequence of claim 6 wherein the pulse pairs include a first non-selective pulse and a second non-selective pulse, and wherein the first non-selective pulse has a flip angle of +360 degrees and the second non-selective pulse has a flip angle of -360 degrees.

**[Claim 9]** 9. The pulse sequence of claim 1 wherein the number of non-selective RF pulses defines a spin lock pulse duration (TSL), and for angiographic contrast the TSL is shorter than that for perfusion imaging.

**[Claim 10]** 10. A method of MR flow imaging comprising the steps of:  
selecting an ROI in which flow therein will be imaged;  
applying a train of low energy RF pulses to suppress magnetization of spins in the ROI;  
exciting longitudinal magnetization of inflowing spins in the ROI; and  
acquiring MR data from the inflowing spins.

**[Claim 11]** 11. The method of claim 10 further comprising the step of applying a crusher gradient to reduce residual transverse magnetization of spins in the ROI prior to the step of exciting.

**[Claim 12]** 12. The method of claim 10 wherein the step of acquiring includes one of:  
EPI readout; and  
spiral readout.

**[Claim 13]** 13. The method of claim 10 wherein the step of selecting includes the step of applying a slice select gradient pulse and a slice select encoding RF pulse having a flip angle of 90 degrees.

**[Claim 14]** 14. The method of claim 10 wherein the step of applying includes the step of playing out a number of RF pulse pairs, one RF pulse of the pair having a +360 degree flip angle and the other RF pulse of the pair having a -360 degree flip angle.

**[Claim 15]** 15. The method of claim 14 further comprising the step of determining the number of RF pulse pairs based on whether an angiographic image acquisition or a perfusion image acquisition is to be carried out.

**[Claim 16]** 16. An MR apparatus to acquire angiographic or perfusion image data with background suppression, the MR apparatus comprising:  
a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an

RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images; and  
a computer programmed to apply a pulse sequence having:  
a slice selective pulse to induce transverse magnetization in spins of a predefined static volume;  
a series of non-selective pulses to suppress the transverse magnetization of the spins of the pre-defined static volume; and  
an excitation pulse to induce transverse magnetization in inflowing spins to the predefined static volume.

**[Claim 17]** 17. The MR apparatus of claim 16 wherein the non-selective pulses are further defined to have an energy level less than that of the slice selective pulse.

**[Claim 18]** 18. The MR apparatus of claim 16 wherein the pulse sequence further has a crusher gradient pulse to reduce residual transverse magnetization of the spins of the predefined static volume before application of the excitation pulse.

**[Claim 19]** 19. The MR apparatus of claim 16 wherein the excitation pulse has a 90 degree flip angle.

**[Claim 20]** 20. The MR apparatus of claim 16 wherein the pulse sequence is further defined by a series of imaging pulses with echo planar readout.

**[Claim 21]** 21. The MR apparatus of claim 16 wherein the pulse sequence is further defined by a series of imaging pulses with spiral readout.

**[Claim 22]** 22. The MR apparatus of claim 16 wherein the series of non-selective RF pulses includes pulse pairs.

**[Claim 23]** 23. The MR apparatus of claim 22 wherein the pulse pairs includes a first non-selective pulse and a second non-selective pulse, and wherein the first non-selective pulse has a flip angle of +360 degrees and the second non-selective pulse has a flip angle of -360 degrees.

**[Claim 24]** 24. A computer readable storage medium having a computer program stored thereon and representing a set of instructions that when executed by a computer causes the computer to:

apply a slice selective RF pulse and gradient to spatially define a volume for background suppression;  
apply a train of non-selective RF pulses to lock spins in the volume; and  
apply another slice selective RF pulse to excite longitudinal magnetization of inflowing spins to the volume.

**[Claim 25]** 25. The computer readable storage medium of claim 24 wherein the computer is further caused to apply an RF excitation pulse with echo planar or spiral readout.